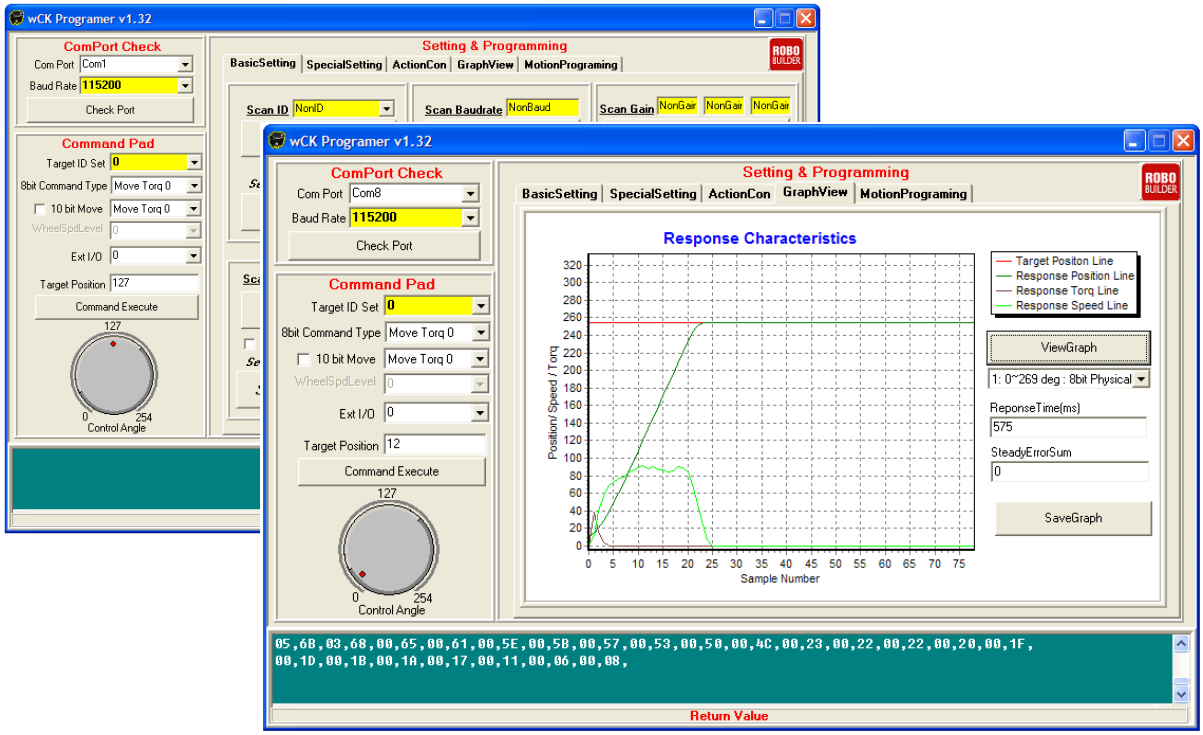
wCK programmer

software version 1.32

Developer's software tool for wCK series Intelligent Robot Module

User's Manual ver 1.03



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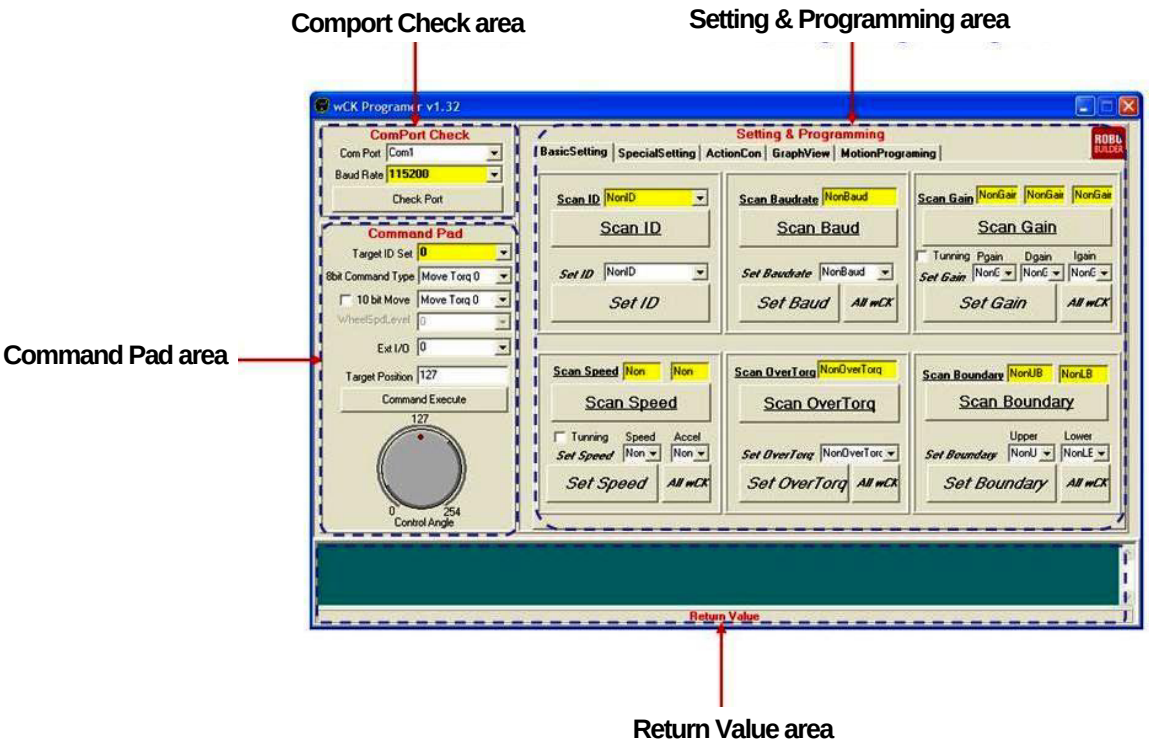
1. Software Overview

The wCK programmer from ROBOBUILDER is the developer's software tool used to configure and control wCK series of intelligent robot modules. The wCK programmer enables you to set and test all parameters and helps you configure the wCK modules for optimal performance for your application requirements through PID gain-tuning technique. This tool also provides its special feature of Self-running motion programming.

2. Function Summary and Screen Layout

The wCK programmer is used to:

- Test motions
- Scan and set parameters
- Do PID gain tuning through motion control
- Monitor Response characteristics graphs
- Program self-running motion



[Screen layout of the wCK programmer]

Comport Check area

This area is used to check the serial com port of user's PC.

Command Pad area

This area is used to test the motions of wCK module by using basic commands.

Setting & Programming area

This area is used to set the parameters of wCK module, tune PID gains, and program self-running motions.

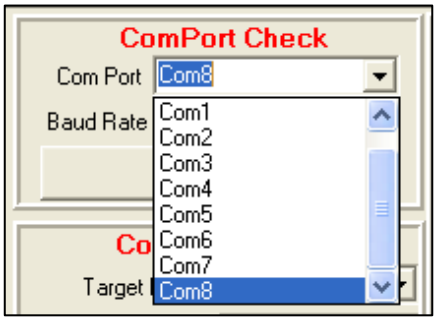
Return Value area

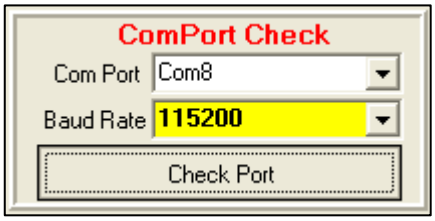
This area shows the return values that come from wCK module.

3. Setting Serial Port

The following procedure explains how to set ComPort on your PC for connecting the wCK module.

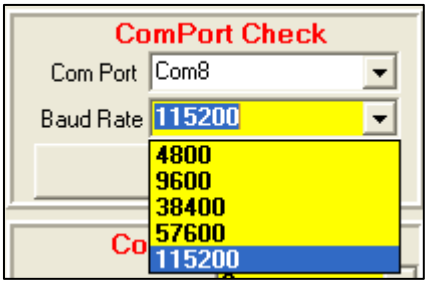
1) Select the COM port of user's PC to use to connect wCK module with and click **[Check Port].**





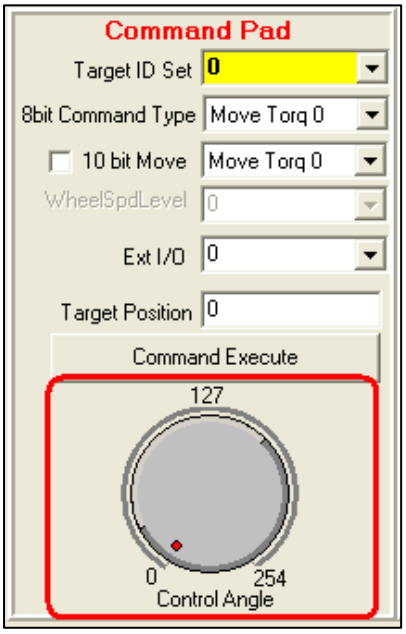
2) If the setting is correctly done, no error message follows. If COM port is not correctly selected, the following error message appears. If this error message appears, check the correct COM port information in the **Control Panel** of your PC and try again.

3) If you know the baud rate of the wCK module to be connected, select the rate as shown in below picture. The Baud Rate here is the one to be used by PC to communicate with wCK module. If the baud rate of wCK module is not known, you don't need to do this at this step. Only if the COM port is correctly set, it automatically searches for and sets the correct baud rate when you later perform [**Scan Baud Rate]** in the [Basic Setting] tap of the [Setting & Programming area].



4. Using Command Pad

4.1 Jog Dial Pad

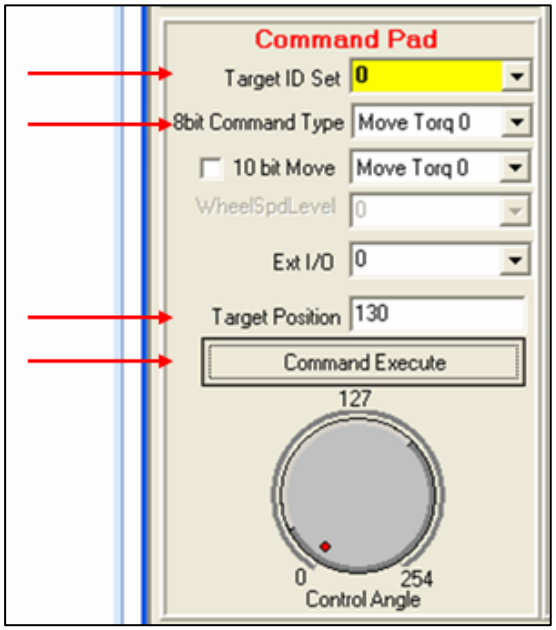


If you drag the mouse on the jog dial pad after selecting the ID of the connected wCK module on the [Target ID Set] menu, the wCK module will rotate according to the mouse movement, this is done in 8 bit command mode.

The red point indicates the current angular position of the wCK module and the current position value is displayed in [Target Position] in real time. The angle on the dial pad is shown in unit of control angle which is different from actual physical rotation angle. As for the relationship of control angle with the physical movement angle, refer to wCK module's manual.

If you drag the jog dial pad after checking the [10 bit Move] check box, the wCK module rotates in 10 bit command mode. The control angle(0 to 254) shown on the dial pad is applied only for 8 bit command mode so please ignore the figure when you use [10 bit Move] and just consider them as in scale of from 0 to 1022 degrees.

4.2 8 bit commands



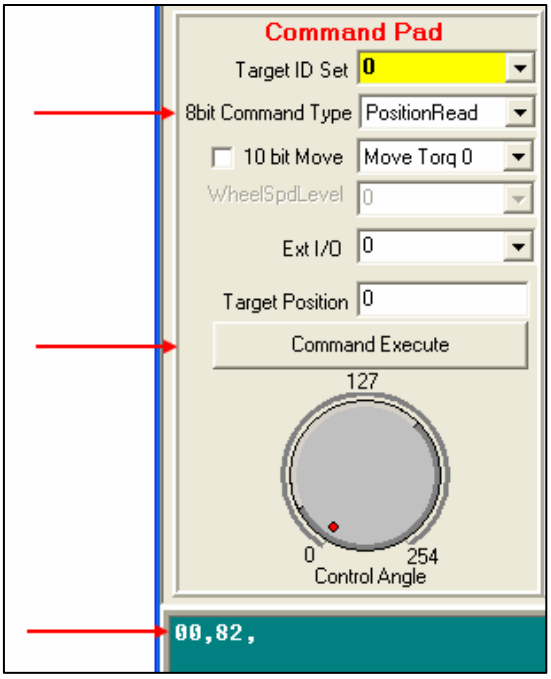
Move Command

[Move Torq N] is the command to have wCK module rotate to target position with the selected torque (levels from 0 to 4).

Select target ID, choose one of the five [Move Torq N] commands, enter Target Position value (0–254), and finally click **[Command Execute]**. The wCK module will move to the specified position.

Position Read Command

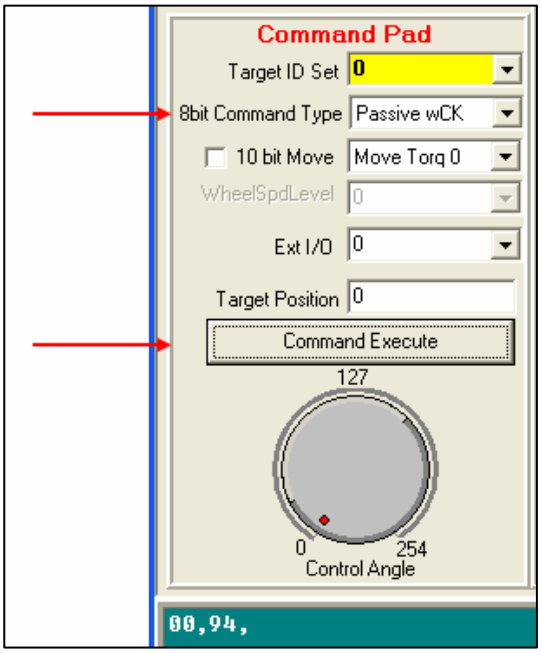
This command is used to read the current position of the wCK module. When you select [**Position Read]** on the menu after selecting the target ID, and click [**Command Execute]**, the current position value appears in the [Return Value] area as shown in the picture. The first byte indicates the current load while the second byte indicates the current position.



Passive wCK Command

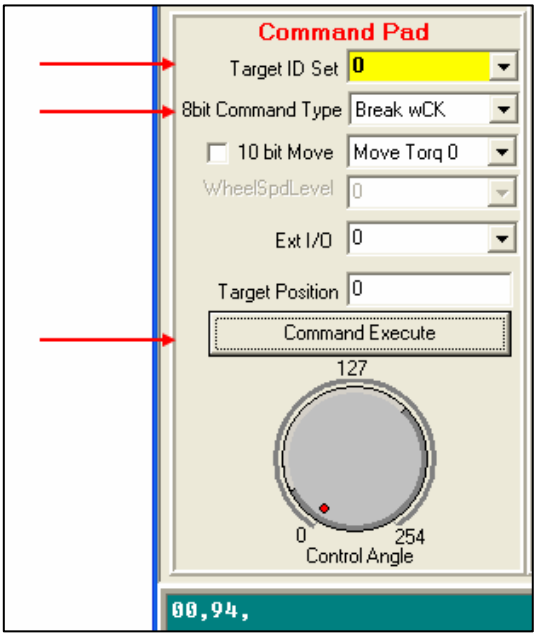
This [Passive wCK] command is used to release the torque from the axis of the wCK module and so that the axis can be moved smoothly by an external force.

When you select [**Passive wCK]** on the menu after selecting the target ID, and click [**Command Execute]**, the wCK module is changed to passive mode.



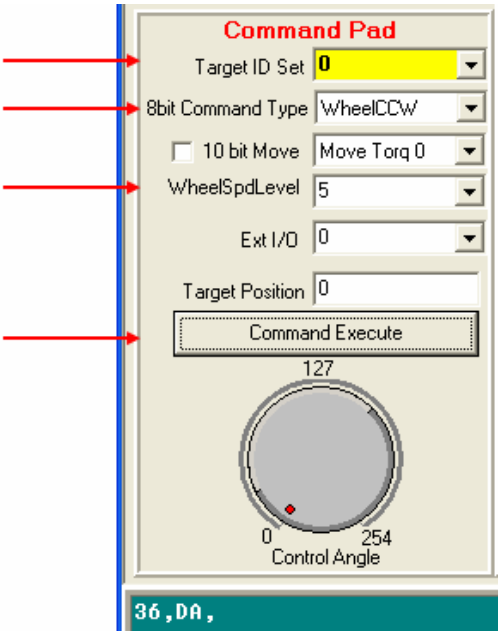
Break wCK Command

This [Break wCK] command is used to stop the movement of selected wCK module without consuming electric power by using the dynamic break effect. When you select [**Break wCK]** on the menu after selecting the target ID, and click [**Command Execute]**, the wCK module is changed to break mode.



Wheel wCK Command

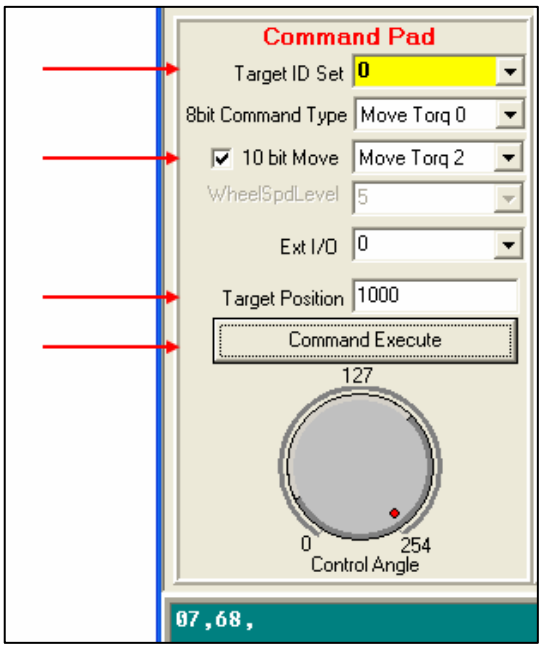
This [Wheel wCK] commands are used to allow the wCK module to move in a 360-degree rotating movement.
When you select [**WheelCW]** (clockwise) or [**WheelCCW]** (counter-clockwise) on the menu after selecting the target ID, the WheelSpdLevel menu get activated. After selecting the rotation speed level (0–30) and click [**Command Execute]**, the module starts rotation.



4.3 10 bit Move Commands

This command is used to have wCK module to move to a specific position by using the designated torque (0 to 4 levels) under 10 bit control mode.

When you select the target ID, check in [10 bit Move] check box, select one out of the five [Move Torq N] commands, input the desired position value (0 to 254), and finally click **[Command Execute],** the wCK module will move to the specified position.



4.4 External I/O Command

This [Ext I/O] command is used to send out a value to the external I/O port that is installed inside the wCK module.

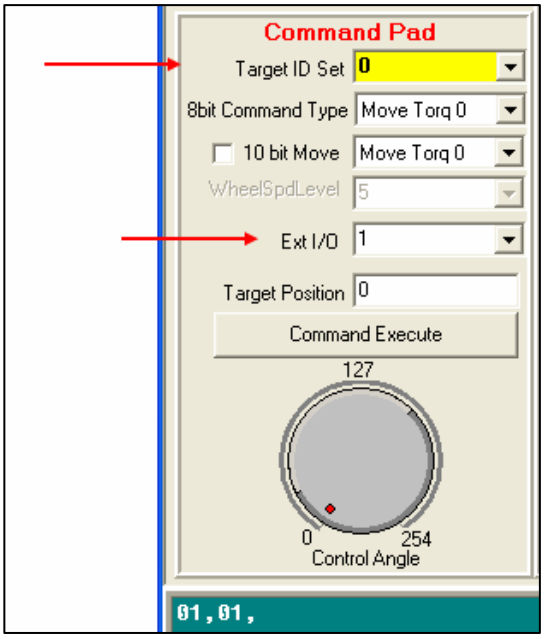
When you select the target ID and select the desired value on the Ext I/O menu, it is sent out to the port. The value is translated as below.

Ext I/O 0: D/O2 = 0, D/O1 = 0;

Ext I/O 1: D/O2 = 0, D/O1 = 1;

Ext I/O 2: D/O2 = 1, D/O1 = 0;

Ext I/O 3: D/O2 = 1, D/O1 = 1;



5. Setting and Self-running Motion Programming

The [Setting & Programming] area consists of the following menu tabs:

Basic Setting (configuration of basic parameters)

The tab is used to set or scan the parameters such as wCK module ID, communication speed (baud rate), PID gains, rotation speed, acceleration/deceleration range, overload, movement boundary, etc.

Special Setting (configuration of special parameters)

This tab is used to set or scan the special parameters such as external I/O port, 10 bit position value, RC servo mode, product information, etc.

ActionCon (motion control)

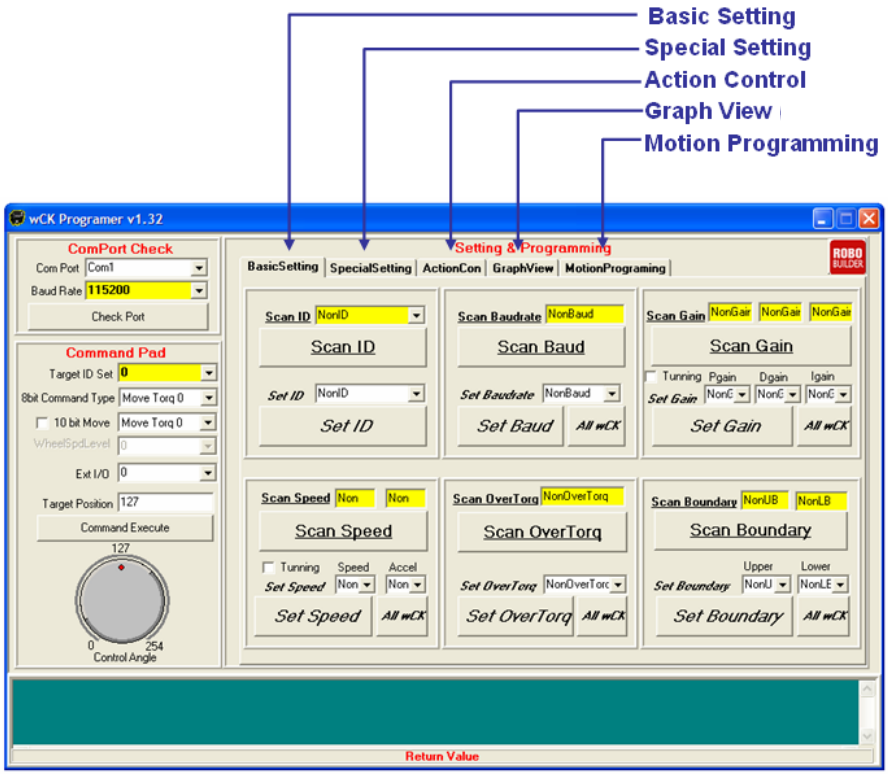
This tab is used to control the motion of wCK module to tune its movement characteristics. It helps monitor the motion characteristics and tune PID gains together with the GraphView tab.

GraphView (response characteristic graph)

This tab shows the response characteristics graph of each motion that is generated by ActionCon tab.

MotionProgramming (self-running motion programming)

This tab is used to program the self-running motion of the wCK module.

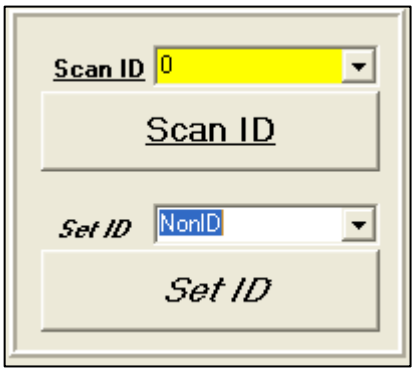


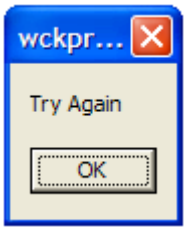
5.1 Basic Setting (Configuration of Basic Parameters)

The tab is used to set or scan the parameters such as wCK module ID, communication speed(baud rate), PID gains, rotation speed, acceleration/deceleration range, overload, movement boundary, etc.

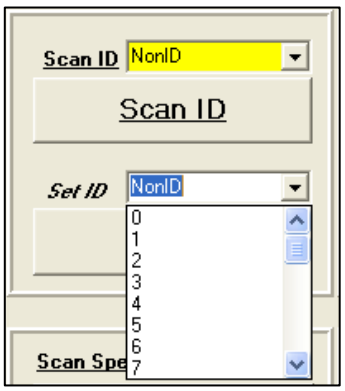
ID Scan and Setup

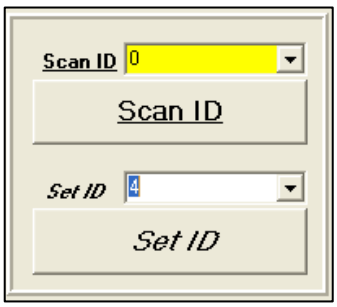
This menu is used to scan or set the ID of the connected wCK module. When you click [**Scan ID]** while the COM port and baud rate settings are correct, it automatically searches and displays the ID number of the connected wCK module. If you click [**Scan ID]** when the communication speed(baud rate) is not matched, an error message appears as shown in the picture below: In this case, run [**Scan Baud Rate]** to adjust the communication speed and click [**Scan ID]** again.

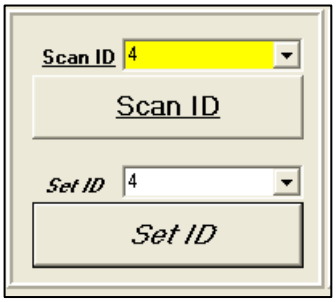




Select the ID (0–30) of the desired wCK module on the Set ID selection menu and click [**Set ID]**. The ID setting is finished when the changed ID is displayed on the [Scan ID] window and the screen displays the message, "Good ID Setting!!!."

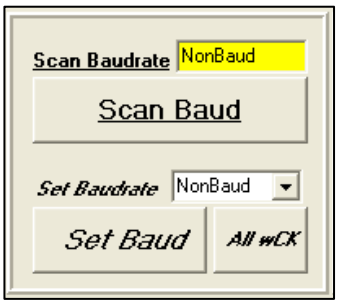


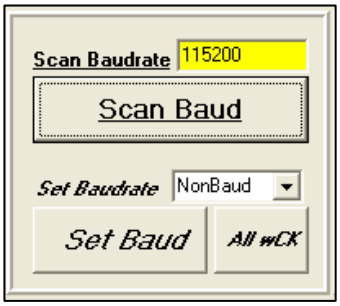




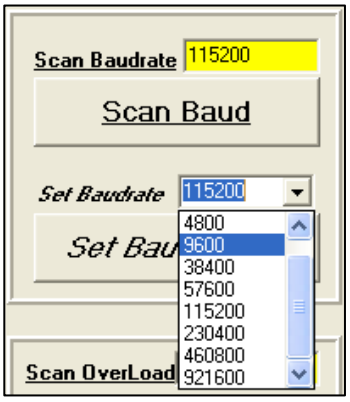
Communication Speed (baud rate) Scan and Setup

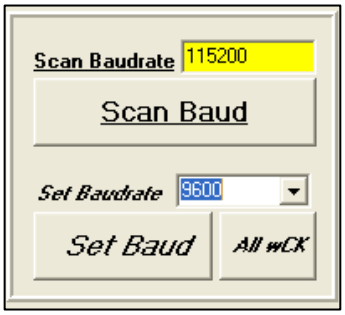
This menu is used to scan or set the communication speed(baud rate) of the connected wCK module. When you click [**Scan Baud]** while the COM port setting is correct, it automatically searches and shows the communication speed of the connected wCK module. The default communication speed is set as 115,200 bps.

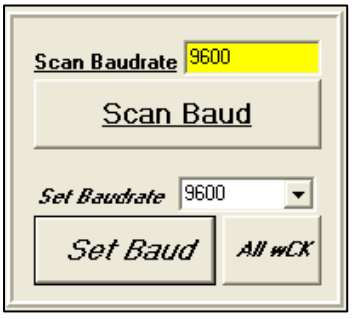




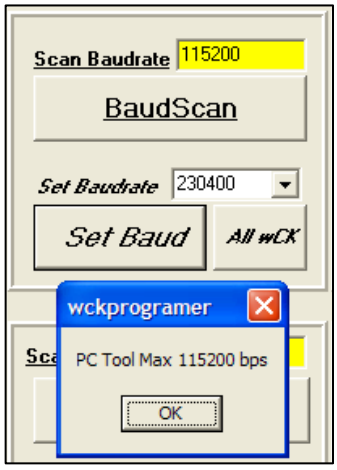
Click [**Set Baud]** after selecting the desired communication speed of the wCK module on the [Set Baudrate] selection menu. The baud rate setting is finished when the changed communication speed is displayed on the [Scan Baud] window and the screen displays the message, "Good Baudrate Setting!!!." If you click [**All wCK]** instead of [Set Baud] while multiple wCK modules are connected, the baud rate is applied for all wCK modules at a time.





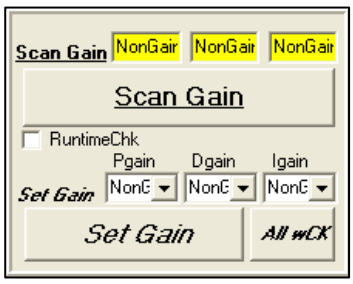


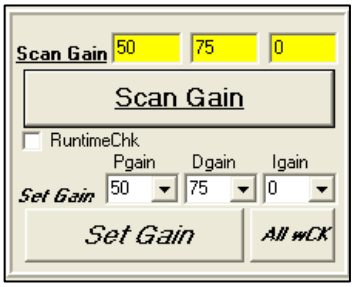
If the communication speed is set to a value higher than 115,200 bps, the following error message appears. This error occurs because the wCK programmer tool does not need that high speed even though the wCK module itself supports up to 921,600bps.



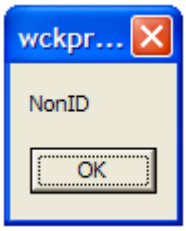
PID Scan and Setup

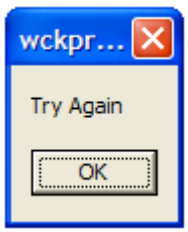
This menu is used to scan or set the PID gains of the connected wCK module. When you click **[Scan Gain]** while the ID and baud rate settings are correct, it automatically searches and displays the gains of the connected wCK module. The default gain values of the wCK module are set as P gain=50, D gain=75, and I gain=0.





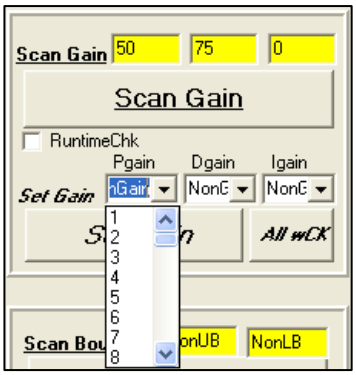
If the Scan Gain function is performed while wrong ID is set, the following [NonID] error message appears. If the Scan Gain function is performed while wrong baud rate is set, the following [Try Again] error message appears.

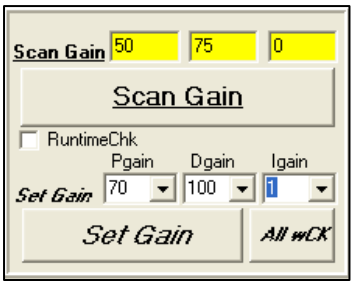


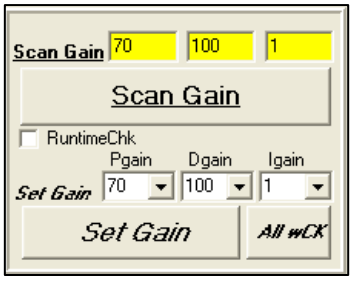


Click [**Set Gain]** after selecting the desired PID gains on the Set Gain selection menu. The gain setting is finished when the changed gain values are displayed on the [Scan Gain] window and the screen displays the message, "Good Gain Setting!!!."

If you click [**All wCK]** instead of [Set Gain] while multiple wCK modules are connected, the gains are applied for all wCK modules at a time. If you check in [RuntimeChk] and perform the Set Gain function, the gain is applied only in runtime. In this case if you power cycle the wCK module, the value is reset to the previous setting.

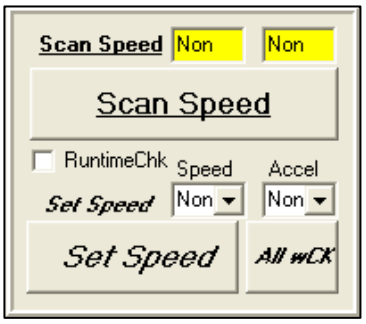


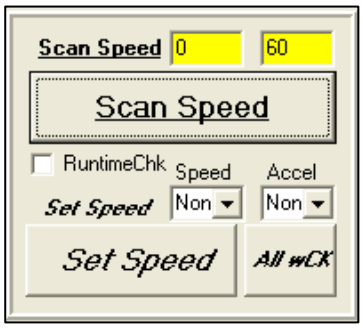




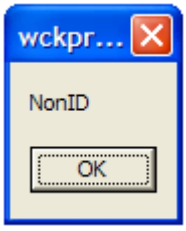
Speed and Acceleration/Deceleration Block Scan and Setup

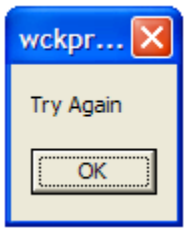
This menu is used to scan or set the speed and acceleration/deceleration range of the connected wCK module. When you click [**Scan Speed]** while the ID and baud rate settings are correct, it automatically searches and displays the speed and acceleration/deceleration ranges of the connected wCK module. The default speed of the wCK module is set to 0 and the acceleration/deceleration range is set to 60.



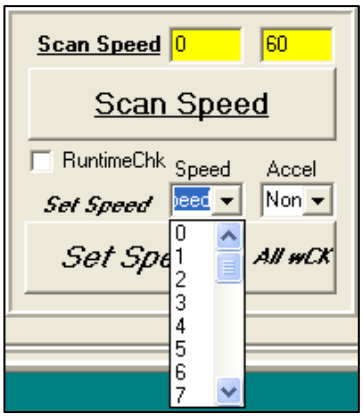


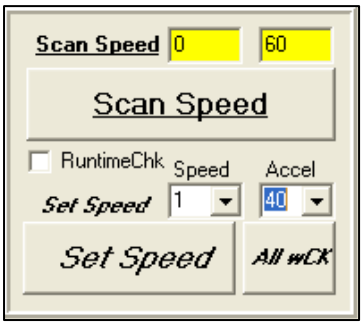
If the Scan Speed function is performed while wrong ID is set, the following [NonID] error message appears. If the Scan Speed function is performed while wrong baud rate is set, the following [Try Again] error message appears.

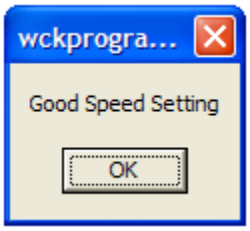


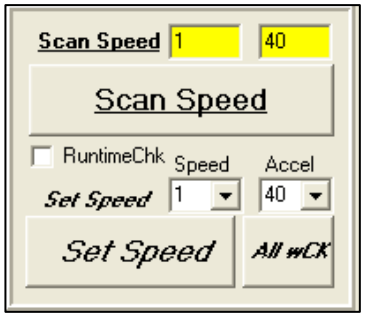


Click **[Set Speed]** after selecting the desired speed and acceleration/deceleration range on the [Set Speed] selection menu. The setting is finished when the changed values are displayed on the [Scan Speed] window and the screen displays the message, "Good Speed Setting!!!." If you click [**All wCK]** instead of [Set Speed] while multiple wCK modules are connected, the speed and acceleration/deceleration range are applied for all wCK modules at a time. If you check in [RuntimeChk] and perform the Set Speed function, the value is applied only in runtime. If you power cycle the wCK module, the values are reset to the previous settings.



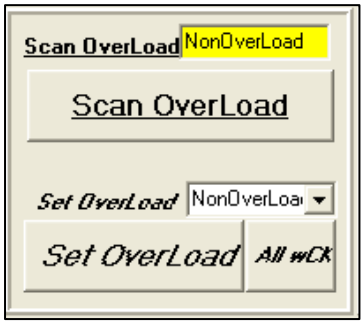


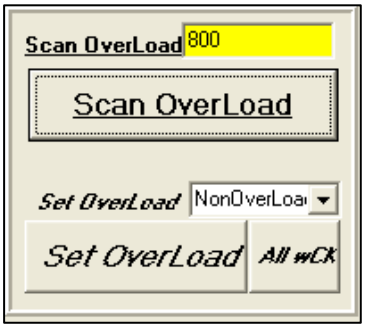




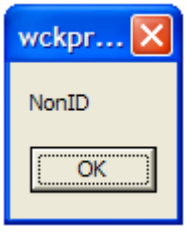
Overload Criteria Scan and Setup

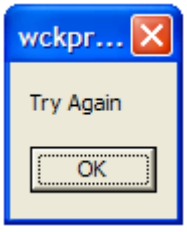
This menu is used to scan or set the overload of the connected wCK module. When you click [**Scan OverLoad]** while the ID and baud rate settings are correct, it automatically searches and displays the overload of the connected wCK module. The default overload of the wCK module is set to 800.



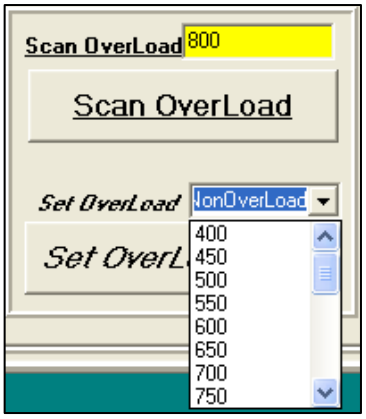


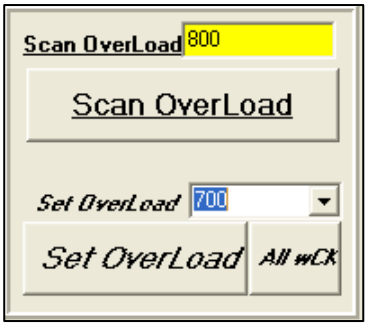
If the Scan OverLoad function is performed while wrong ID is set, the following [NonID] error message appears. If the function is performed while wrong baud rate is set, the following [Try Again] error message appears.

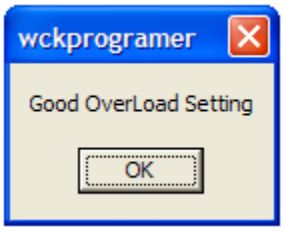


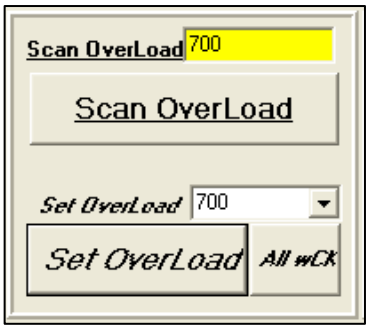


Click **[Set OverLoad]** after selecting the desired overload value on the [Set OverLoad] selection menu. The setting is finished when the changed values are displayed on the [Scan OverLoad] window and the screen displays the message, "Good OverLoad Setting!!!." If you click **[All wCK]** instead of OverLoad while multiple wCK modules are connected, the overload value is applied for all wCK modules at a time.



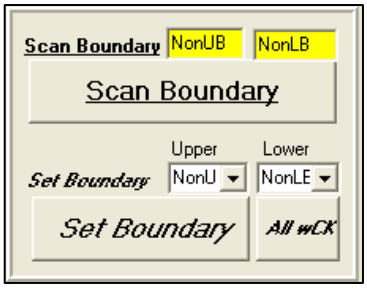


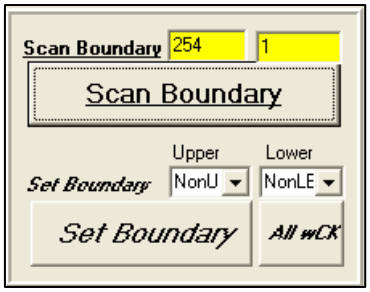




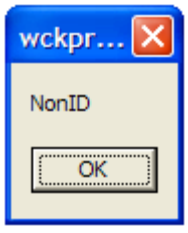
Movement Boundary Scan and Setup

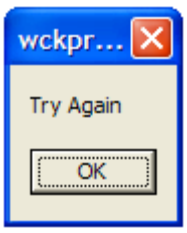
This menu is used to scan or set the movement boundary of the connected wCK module. When you click **[Scan Boundary]** while the ID and baud rate settings are correct, it automatically searches and displays the motion boundary of the connected wCK module. The default value of movement boundary of the wCK module is set to minimum 1 and maximum 254.



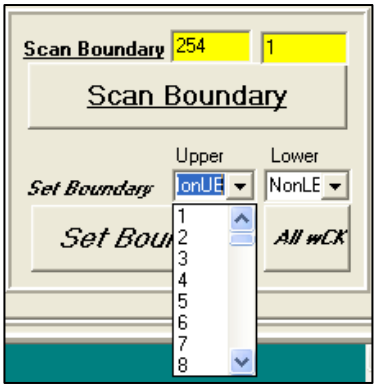


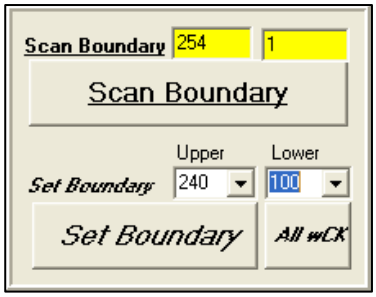
If the Scan Boundary function is performed while wrong ID is set, the following [NonID] error message appears. If the function is performed while wrong baud rate is set, the following [Try Again] error message appears.

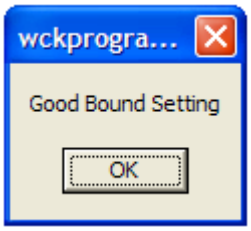


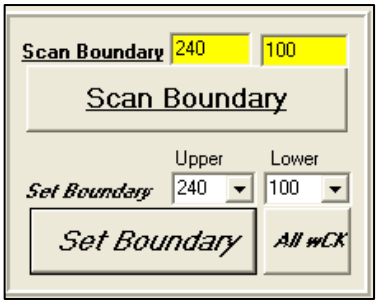


Click **[Set Boundary]** after selecting the desired movement boundary on the [Set Boundary] selection menu. The setting is finished when the changed values are displayed on the [Scan Boundary] window and the screen displays the message, "Good Boundary Setting!!!." If you click [**All wCK]** instead of [Set Boundary] while multiple wCK modules are connected, the movement boundary values are applied for all wCK modules at a time.







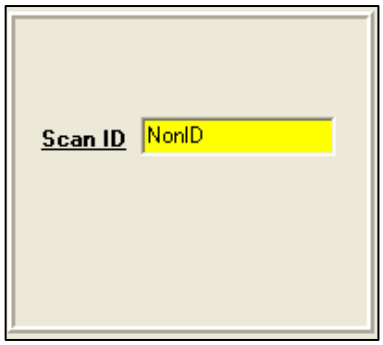


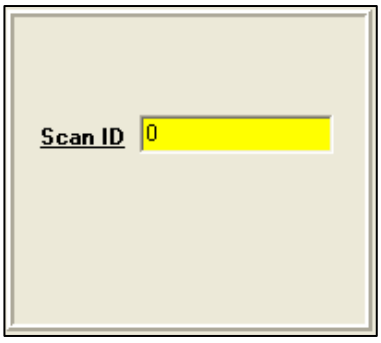
5.2 Special Setting (Configuration of Special Parameters)

This tab is used to set or scan the special parameters such as external I/O port, 10 bit position value, RC servo mode, product information, etc.

wCK Module ID Display

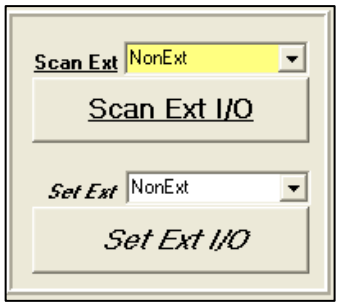
The first menu of [Special Setting] is the display of the ID number of the connected wCK module. If the ID is not set, [NonID] appears. But when the ID scan is finished, the ID of the connected module appears.

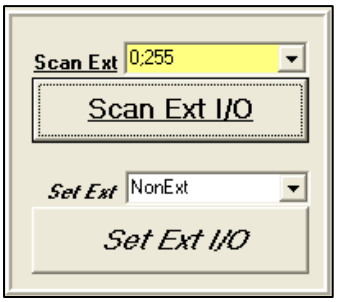


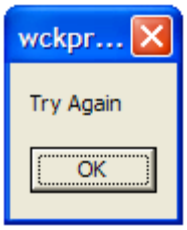


External I/O Port Scan and Setup

This menu is used to scan (D/O, A/D) or set (D/O) the external I/O port value of the connected wCK module. When you click **[Scan Ext I/O]** while the ID and baud rate settings are correct, it automatically searches and displays the I/O port value of the connected wCK module. When the function is performed while wrong ID is set, the [Try Again] error message appears. The external I/O port value of the wCK module is set to 0:X when any external I/O device is not connected. The first number 0 indicates the D/O value and the second X value is integer value that indicates the 1 byte A/D value. When you scan it while the A/D input device is not connected, the X value displayed is meaningless.



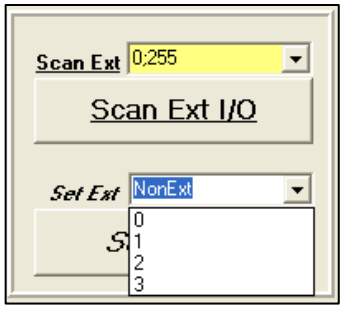


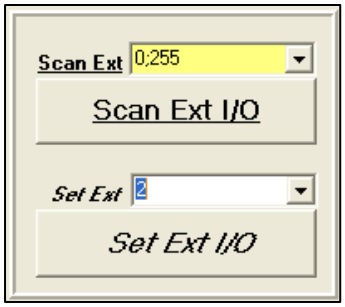


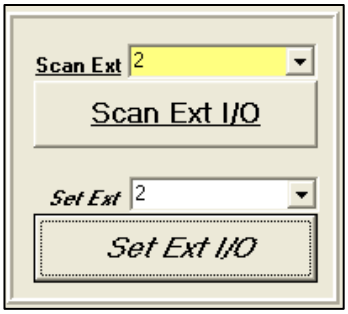
[Meaning of the first Number]

0: D/O2 = 0, D/O1 = 0 1: D/O2 = 0, D/O1 = 1 2: D/O2 = 1, D/O1 = 0 3: D/O2 = 1, D/O1 = 1

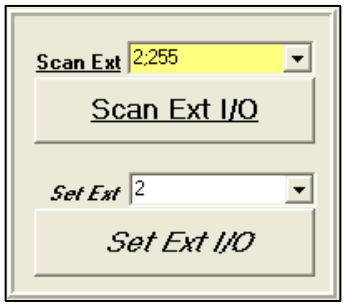
Click **[Set Ext]** after selecting the desired D/O output value on the [Set Ext] selection menu. The setting is finished when the changed value is applied to Scan Ext.





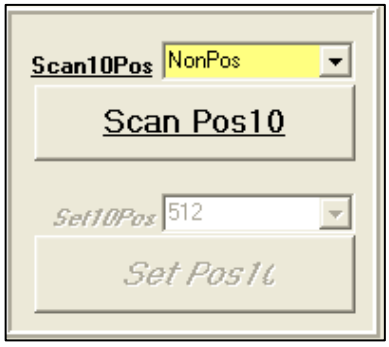


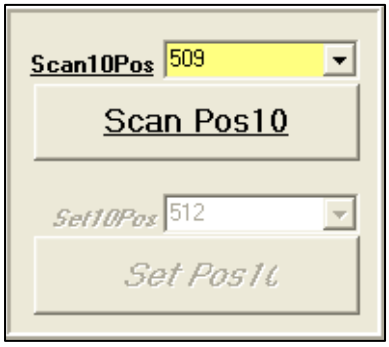
If you click **[Scan Ext I/O]** again, the values for D/O and A/D are displayed with 0:X.



Read 10 bit Position

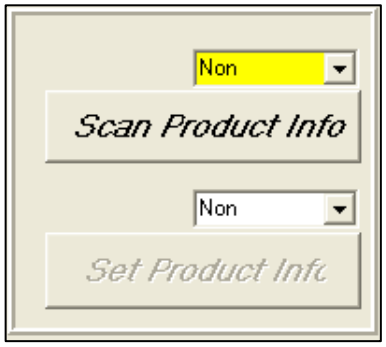
This menu is used to read and display the current position value of the connected wCK module in 10 bit mode.

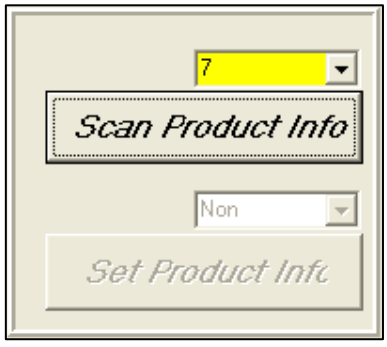




Product Information Scan

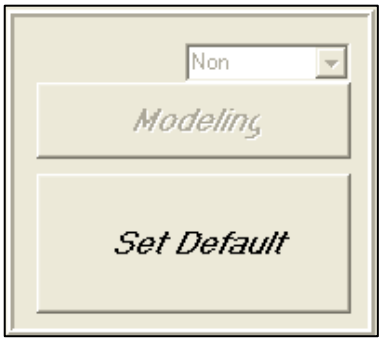
This menu is used to scan the manufacturing information of the wCK module. The scanned product information is the data managed by the manufacturer.





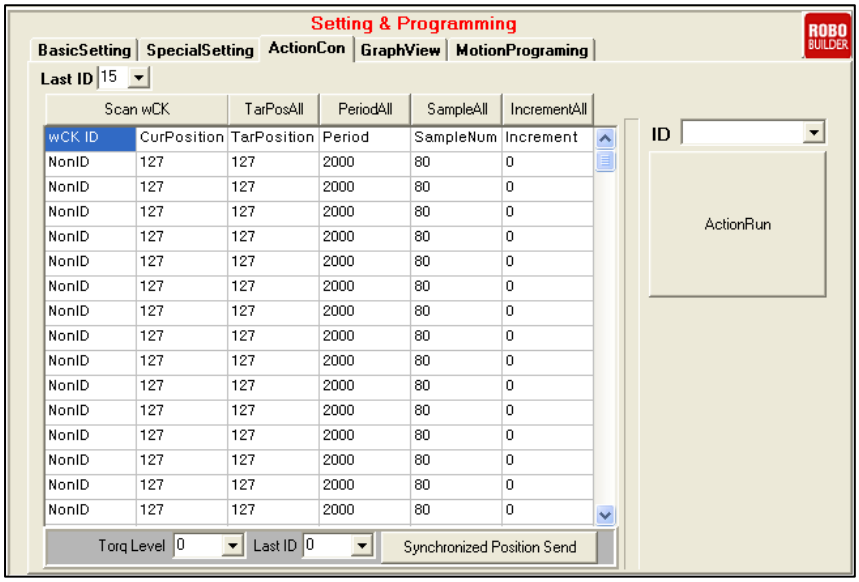
Parameter Initialization

This menu is used to initialize the parameters of the wCK module. It initializes all parameters in BasicSetting and self-running motion program.

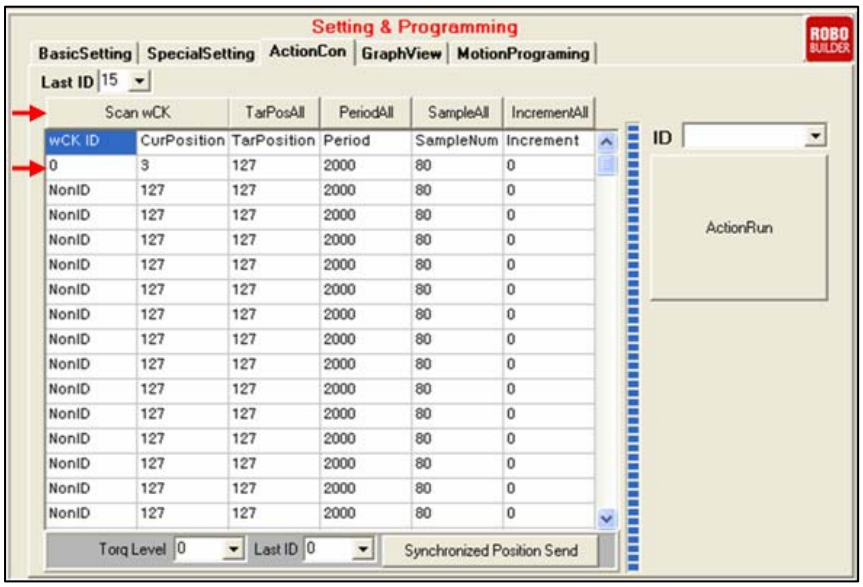


5.3 ActionCon (Motion Control)

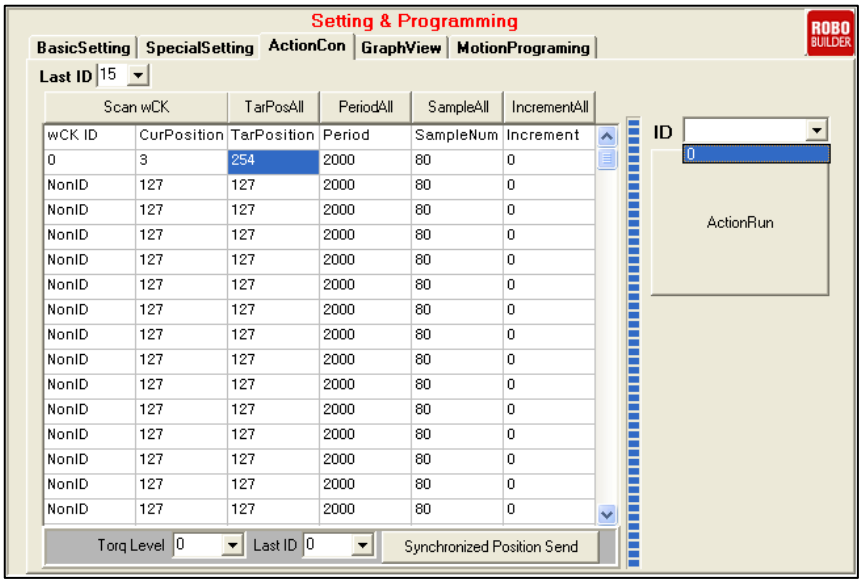
This tab is used to execute and control the motion to tune the movement characteristics of the wCK module. It monitors the motion characteristics and help tune the PID gains used along with the [GraphView] tab. The following picture is the initial screen.



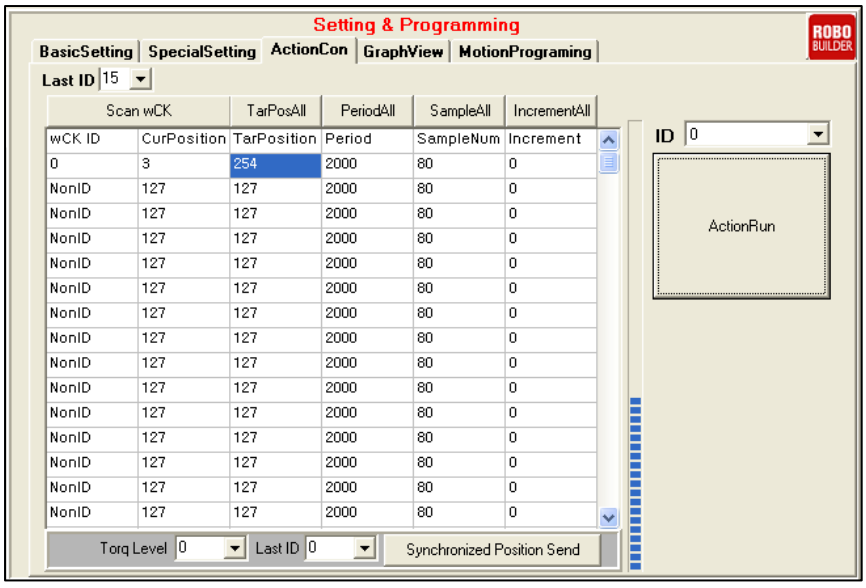
When you click **[Scan wCK]**, the ID of the connected wCK module and the current position value appear. The scan is finished when the blue bar graph on the right reaches the top.



As shown below, specify the target position(TarPosition), monitoring time(period), number of samplings(SampleNum), and Increment, select the ID of the target wCK module, and finally click [**ActionRun]** on the right. Last ID indicates the highest ID number among all connected wCK modules. During the scan, the program scans all modules up to the specified Last ID so you must set it properly. In order to minimize the scan time, it is recommended to set correct Last ID.



The blue vertical stick bar graph reaches the top while the wCK module rotates and move to the specified target position. When the bar graph reaches the top, the motion is completed. Go and analyze the response characteristics in the [GraphView] tab.

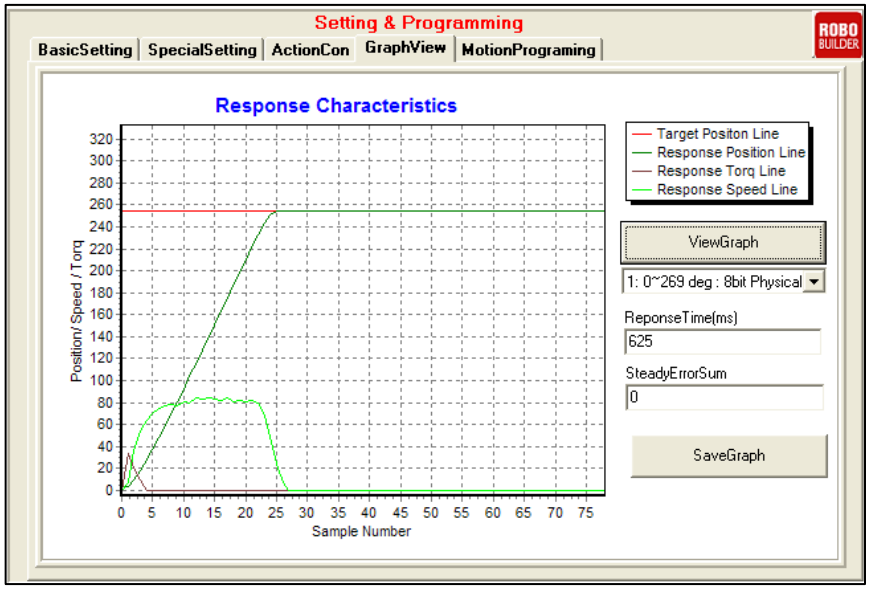


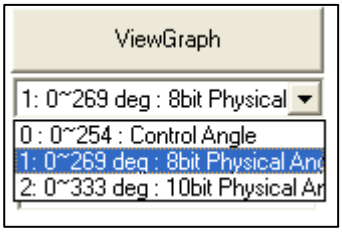
5.4 GraphView (Response Characteristics Graph)

It shows the response characteristics graph of the motion executed in the [ActionCon] tab.

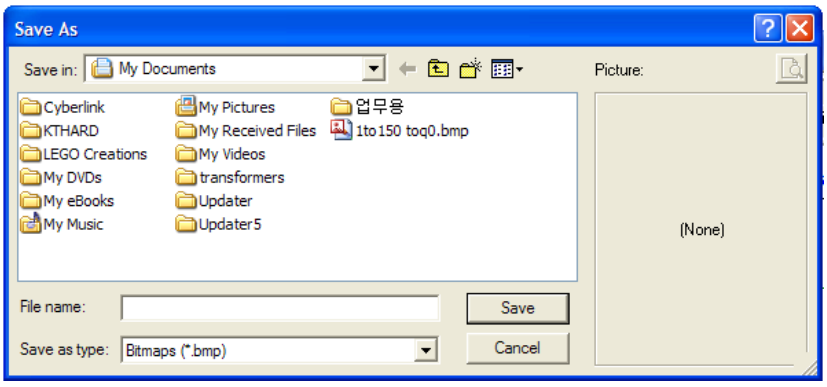
When you click **[ViewGraph]** after performing a motion in [ActionCon] tab, the response characteristics graph appears.

You can select the type of display angle by using the selection menu below the [ViewGraph] button.



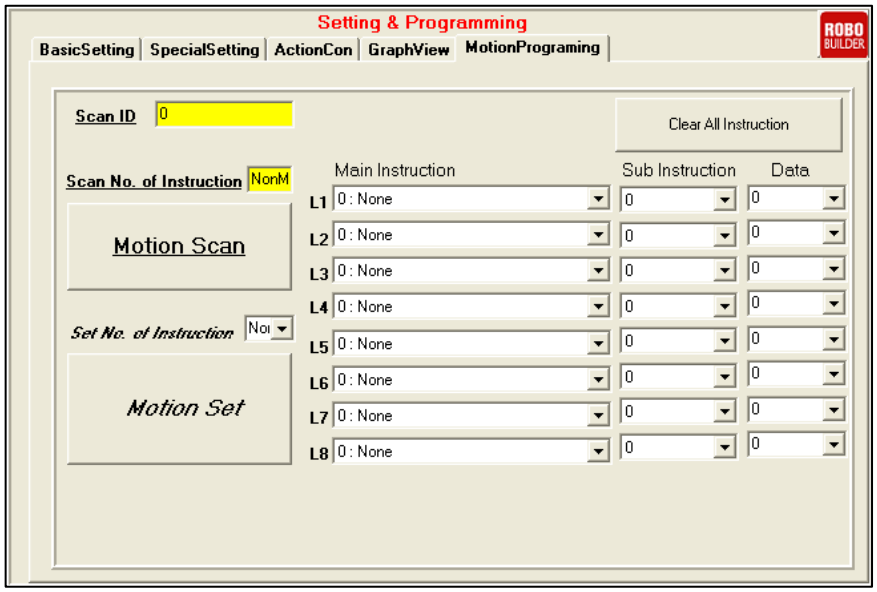


When you click **[SaveGraph],** the graph can be saved into a bitmap file as shown in the picture below.

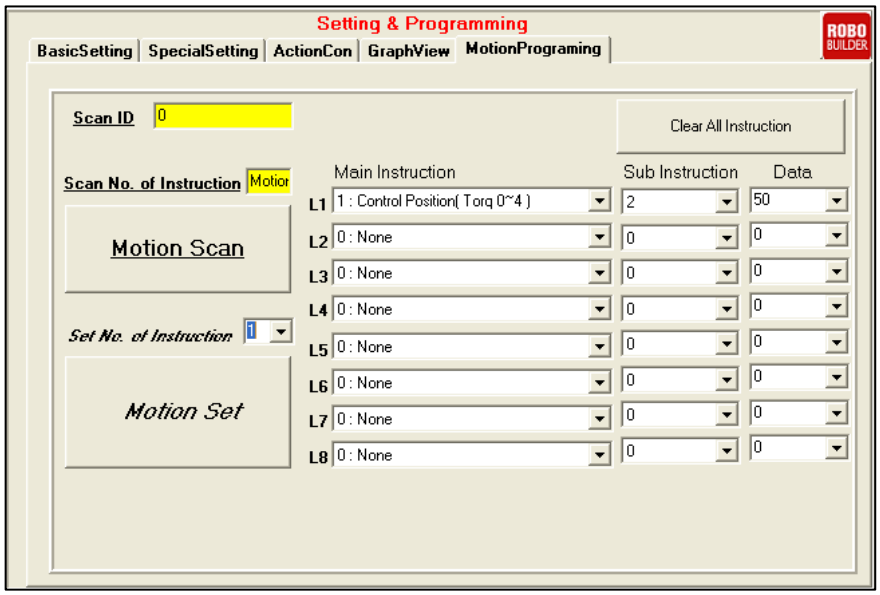


5.5 MotionProgramming (Self-running Motion Programming)

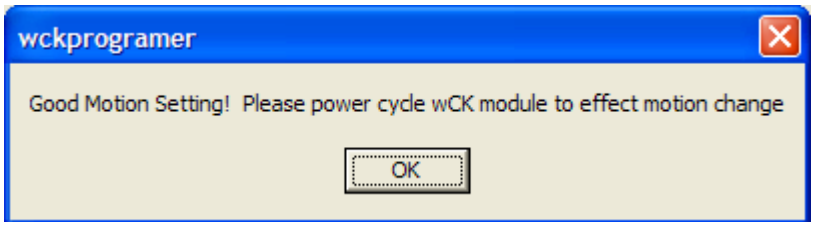
This tab is used to program the self-running motion of the wCK module. The initial screen is like as follows: If [NonID] appears on the [Scan ID] window, it indicates that the ID of the connected wCK module is not set. Accordingly, first check the module connection and scan the ID in [BasicSetting] tab.



Create and edit a self-running motion program by selecting values for [Main Instruction], [Sub Instruction], and [Data]. When finished with motion programming, select the number of program code lines in the [Set No. of Instruction] window and click [**Motion Set**]. When executing a motion, the software runs up to this specified number of lines.



When [Motion Set] is completed, the number of lines is displayed in [Scan No. of Instruction] and the following message appears. When power cycle the wCK module, the self-running motion is executed automatically.

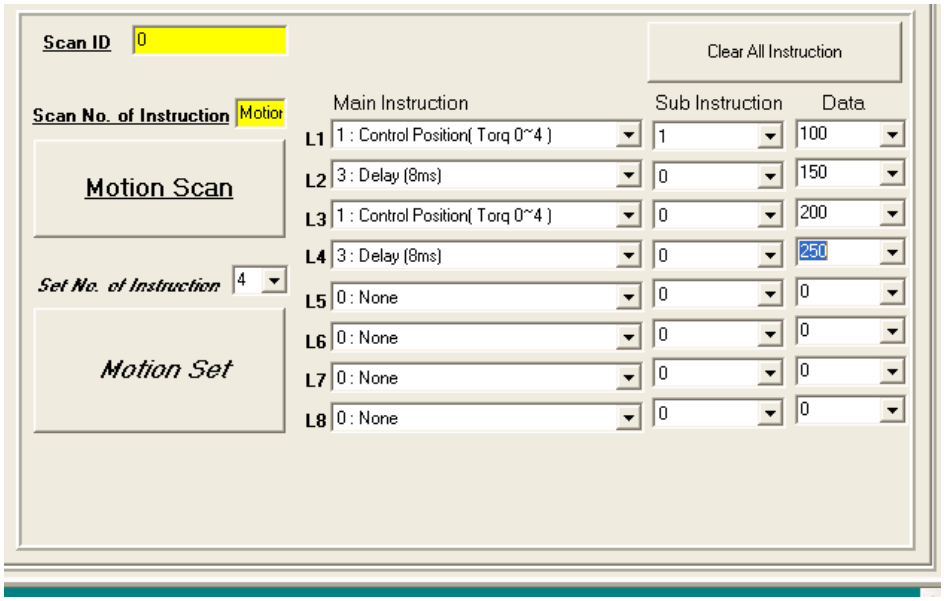


The programming logics for the self-running motion is as follows:

Motion Command(1 Byte)		Motion Data(1 Byte)
Main Instruction	**Sub Instruction**	**Data**
0: None	0	X
1: Position Control	Speed(0~4)	8 bit Position Value
2: Motion Type	1(Passive), 2(Power Down), 3(Wheel CCW), 4(Wheel CW)	The Speed value in Wheel Mode(0~15)
3: Delay Time(Max 4,095 ms)	Upper 4 bit delay value	Lower 8 bit delay value(in ms)
4: DIO	X	2 bit external port output value
5: Position Conditional Decision	1("==") 2(">") 3("<") 4(">=") 5("<=")	8 bit Position Value
6: A/D Conditional Decision	1("==") 2(">") 3("<") 4(">=") 5("<=")	8 bit external port A/D input value
7: No of Repetition	X	0 : Infinity, 1 to 254(No of repetition)
8: End of Program	X	X

[Example Program]

The rotation axis of a wCK module moves to position 100 at torque 1, then moves to position 200 at torque 0 after delay 150, then repeat this motion after delay 250.


Scan ID
0
Clear All Instruction
Scan No. of Instruction
Motion
Main Instruction
Sub Instruction
Data
Motion Scan
L1 1 : Control Position(Torq 0~4) 1 100
L2 3 : Delay (8ms) 0 150
L3 1 : Control Position(Torq 0~4) 0 200
L4 3 : Delay (8ms) 0 250
Set No. of Instruction
4
L5 0 : None 0 0
L6 0 : None 0 0
Motion Set
L7 0 : None 0 0
L8 0 : None 0 0

When you click **[Clear All Instruction]** on the upper right corner of the screen, the created logics on the screen are all deleted.